521 M7280 – SATELLITE GEODESY

SPRING SEMESTER 2017

Lab No. 3

handed out Wednesday, March 15, 2017
due Wednesday, March 22, 2017, 09:10 **Name:** _____

Spatial Variations of Radii of Curvatures

1. Write a Matlab program that computes the radii of curvatures on meridian plane (M), the radii of curvatures on prime vertical plane (N), the radii of average curvatures, and the radii of Gaussian curvatures for $\phi = -90^o \sim +90^o$ at every $\Delta\phi = 1^o$ interval, using GRS67 and GRS80 ellipsoidal parameter values.

   a. list your results in a table form with 9 columns (latitude, M_{67}, N_{67}, $R_{avg,67}$, $R_{G,67}$, M_{80}, N_{80}, $R_{avg,80}$, $R_{G,80}$).
   b. plot M, N, R_{avg}, and R_G values as functions of ϕ values (in one map).

2. Discuss EXTENSIVELY the behaviors of these radii of curvatures.

3. Compute the arc distance between two points on the surface of the earth's reference ellipsoid (GRS67 and GRS80). The two points are at ($121^0$10'20.0123", $23^0$11'30.3255") and ($121^0$42'30.9185", $24^0$03'10.1978").

4. Describe the differences and similarities between the results obtained from GRS67 and GRS80.

Use for $\boldsymbol{GM} = 398600.4418\left(\text{km}^3/\text{s}^2\right)$, $\omega_e^* = 7292115.8553\times10^{-11}\left(\text{rad/s}\right)$, $\omega_e = 7292115\times10^{-11}\left(\text{rad/s}\right)$, and $\boldsymbol{R} = 6371.000000\left(\text{km}\right)$.

Your (individual) final report should contain (use A4 papers):

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (% .....)
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results